



Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

July 18, 2019  
WBL-19-037

10 CFR 50.73

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

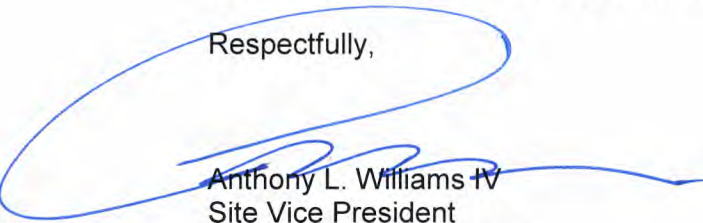
Watts Bar Nuclear Plant, Unit 2  
Facility Operating License No. NPF-96  
NRC Docket No. 50-391

Subject: **Licensee Event Report 391/2019-001-00, Manual Reactor Trip Due to Main Feedwater Regulating Valve Failing Closed**

This submittal provides Licensee Event Report (LER) 391/2019-001-00. This LER provides details concerning a manual plant trip as a result of a main feedwater regulating valve failing closed. This condition is being reported as a safety system actuation of the reactor protection system and the auxiliary feedwater system in accordance with 10 CFR 50.73(a)(2)(iv)(A).

There are no regulatory commitments contained in this letter. Please direct any questions concerning this matter to Tony Brown, WBN Licensing Manager, at (423) 365-7720.

Respectfully,



Anthony L. Williams IV  
Site Vice President  
Watts Bar Nuclear Plant

Enclosure  
cc: See Page 2

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cc (Enclosure):

NRC Regional Administrator - Region II  
NRC Senior Resident Inspector - Watts Bar Nuclear Plant



## LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. Facility Name Watts Bar Nuclear Plant, Unit 2	2. Docket Number 05000391	3. Page 1 OF 5
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4. Title Manual Reactor Trip Due to Main Feedwater Regulating Valve Failing Closed
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5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
05	22	2019	2019	- 001	- 00	07	18	2019	N/A	05000
									Facility Name	Docket Number
									NA	05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
95	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A

12. Licensee Contact for this LER	
Licensee Contact Dean Baker, Licensing Engineer	Telephone Number (Include Area Code) (423) 452-4589

13. Complete One Line for each Component Failure Described in this Report									
Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	SJ	FCV	FISHER	Y					

14. Supplemental Report Expected		15. Expected Submission Date		Month	Day	Year
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)	<input checked="" type="checkbox"/> No			N/A	N/A	N/A

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On May 22, 2019, at 0233 Eastern Daylight Time (EDT), Watts Bar Nuclear Plant Unit 2 reactor was manually tripped due to a failure of the Steam Generator (SG) number 2 Main Feedwater Regulating Valve (MFRV) during power ascension following a refueling outage. Concurrent with the reactor trip, the Auxiliary Feedwater system actuated as designed. All Control and Shutdown rods fully inserted. All safety systems responded as designed.

This event was caused by a defective actuator diaphragm that led to premature failure and subsequent loss of control of the SG 2 MFRV. Contributing to this event, personnel missed an opportunity to identify the actuator diaphragm was defective during its replacement. Corrective actions include replacement of the defective diaphragm and revising the procedure for diaphragm inspection and installation.

This condition is being reported as a safety system actuation in accordance with 10 CFR 50.73(a)(2)(iv)(A).

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Watts Bar Nuclear Plant, Unit 2	05000391	2019	- 001	- 00

**NARRATIVE****I. Plant Operating Conditions Before the Event**

Watts Bar Nuclear Plant (WBN) Unit 2 was at 95 percent rated thermal power (RTP). Unit 1 was unaffected by this event.

**II. Description of Event****A. Event Summary**

On May 22, 2019, at 0233 Eastern Daylight Time (EDT), Watts Bar Nuclear Plant Unit 2 reactor was manually tripped due to a failure of the Steam Generator (SG) number 2 Main Feedwater Regulating Valve (MFRV){EIS:FCV} during power ascension following a refueling outage. Concurrent with the reactor trip, the Auxiliary Feedwater system {EIS:BA} actuated as designed. All Control and Shutdown rods fully inserted. All safety systems responded as designed.

This event is being reported to the Nuclear Regulatory Commission (NRC) under 10 CFR 50.73(a)(2)(iv)(A) as a safety system actuation of the Reactor Protection System (RPS) and the Auxiliary Feedwater (AFW) system.

**B. Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event**

No inoperable structures, systems, or components contributed to this condition.

**C. Dates and approximate times of occurrences**

<u>Date</u>	<u>Time</u> <u>(EDT)</u>	<u>Event</u>
5/22/19	0231	Entered 2-AOI-16, Loss of Normal Feedwater, due to SG 2 MFRV failing closed.
5/22/19	0233	Unit 2 Reactor manually tripped due to uncontrolled lowering level in SG 2.
5/22/19	0234	Entered 2-E-0, Reactor Trip or Safety Injection
5/22/19	0236	Entered 2-ES-0.1, Reactor Trip Response
5/22/19	0314	Entered 2-GO-5, Unit Shutdown from 30 percent Reactor Power to Hot Standby

**D. Manufacturer and model number of each component that failed during the event**

The component that failed was the diaphragm of a Fisher Type SS-137 Reverse-Action Diaphragm actuator, diaphragm part number 2R6376X0082.



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## **NARRATIVE**

### **E. Other systems or secondary functions affected**

No other systems or secondary functions were affected.

### **F. Method of discovery of each component or system failure or procedural error**

The component failure became apparent when the SG 2 MFRV failed closed.

### **G. Failure mode, mechanism, and effect of each failed component**

The MFRV closed due to a failed actuator diaphragm.

### **H. Operator actions**

Upon identifying the SG 2 MFRV had failed closed, operations personnel manually tripped the plant and followed operations procedures in response to a plant trip.

### **I. Automatically and manually initiated safety system responses**

The plant was manually tripped when the SG 2 MFRV failed closed.

## **III. Cause of the Event**

### **A. Cause of each component or system failure or personnel error**

The SG 2 MFRV failed closed as a result of the installation of a defective valve actuator diaphragm.

### **B. Cause(s) and circumstances for each human performance related root cause**

The personnel performing maintenance on the SG 2 MFRV missed an opportunity to identify the diaphragm they replaced was defective.

## **IV. Analysis of the Event**

The SG MFRVs control flow to the steam generators to maintain level within a desired operating band. The isolation of a single MFRV causes the level in the associated SG to rapidly lower. On May 22, 2019 when SG 2 MFRV failed closed, SG level lowered and operations personnel manually tripped the reactor prior to reaching the SG level automatic trip setpoint.

Investigation revealed the diaphragm in the MFRV that had been replaced during the prior unit outage had torn. This failure was due to a defective diaphragm. Additionally, maintenance personnel did not identify the defect prior to installation.



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Watts Bar Nuclear Plant, Unit 2	05000391	YEAR	SEQUENTIAL NUMBER	REV NO.
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## NARRATIVE

### V. Assessment of Safety Consequences

This event closely matches and is bounded by the Loss of Normal Feedwater event described in the Updated Final Safety Analysis Report (UFSAR). A probabilistic risk review of this event shows the risk from this trip is very small.

- A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event

Not applicable.

- B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident

Not applicable.

- C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service

Not applicable.

### VI. Corrective Actions

These events were entered into the Tennessee Valley Authority (TVA) Corrective Action Program and are being tracked under Condition Report (CR) 1518719.

- A. Immediate Corrective Actions

The valve diaphragm was replaced with a non-defective diaphragm and the plant was returned to operation.

- B. Corrective Actions to Prevent Recurrence or to reduce probability of similar events occurring in the future

Corrective actions include revising the maintenance instructions for diaphragm inspection requirements.

### VII. Previous Similar Events at the Same Site

LER 391/2017-002-00 submitted on May 12, 2017, documents an event where the reactor was manually tripped as a result of a secondary plant transient. This event resulted when scaffold



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CONTINUATION SHEET**

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		2019	- 001	- 00

**NARRATIVE**

crews inadvertently depressed the local trip button for the 2A Hotwell pump, which resulted in the secondary system transient.

LER 391/2016-007-00 submitted on October 21, 2016 documents a manual reactor trip due to a loss of main feedwater. The loss of main feedwater was due to a leak on a hydraulic fitting associated with the Main Feedwater Pump Turbine High Pressure Governor valve, resulting in the valve going partially closed. Subsequent investigation determined the leak to be caused by the installation of incompatible fittings associated with the governor valve that occurred during plant construction.

The previous similar events have different direct causes than this event.

**VIII. Additional Information**

There is no additional information.

**IX. Commitments**

There are no new commitments.